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# NRE Staff Report

1979 HERBICIDE, DEFOLIANT, AND DESICCANT USE  
ON COTTON IN THE UNITED STATES

by

Peter R. Rich

May 1982

ERS Staff Report No. AGES820504

Natural Resource Economics Division  
Economic Research Service  
U.S. Department of Agriculture  
Washington, D.C. 20250





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By Peter R. Rich; Natural Resource Economics Division, Economic Research Service,  
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#### ABSTRACT

Farmers reported that 18.6 million pounds (a.i.) of herbicides and 23.2 million pounds of defoliant and desiccants were applied to cotton during 1979. Herbicide acre-treatments totaled 22.9 million and consisted of 20.5 million with single material herbicides, and 2.4 million with herbicide mixes. Defoliant and desiccant acre-treatments totaled 9.2 million and consisted of 8.1 million single material defoliant and desiccants and 1.1 million tank-mixes. The major herbicides were fluometuron, glyphosate, MSMA, and trifluralin. The primary defoliant and desiccants were arsenic acid, DEF, paraquat, and sodium chlorate. Coefficients of variation were computed for acres treated with specific pesticides.

Key words: Pesticides, herbicides, defoliant, desiccant, active ingredient, acres treated, acre-treatments, application rates, cotton.

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\* This paper was prepared for limited distribution to the research community outside the U.S. Department of Agriculture. Use of product names in this report is for identification only, and does not imply endorsement by the U.S. Department of Agriculture. \* \* \* \* \*

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## INTRODUCTION

This report presents herbicide, defoliant, and desiccant use data for cotton grown in the major producing States in 1979. Information is included on acres treated, acre-treatments, pounds of active ingredient used per season and per treatment, and number of applications. This report emphasizes U.S. and regional totals, with State level data included in the Appendices. The information in this report should be useful to policymakers, academic researchers, and private sector groups in evaluating the impacts of regulatory actions on specific pesticides and conducting economic analyses of pesticide use on cotton.

Herbicide use on cotton increased dramatically during the 1950's to the mid-1960's. In 1952 and 1958 the cotton acreage treated with herbicides was 5 and 7 percent, respectively. In 1966, 52 percent of the cotton acreage was treated with herbicides. Since 1971 herbicide use has been in the 80 to 90 percent range for acres treated. In 1971, 82 percent were treated, 84 percent in 1976, and 91 percent in 1979. Growers have substituted herbicides for mechanical cultivation and hand labor as costs of machinery and labor have risen.

## METHODOLOGY

The Economics, Statistics, and Cooperatives Service collected cotton pesticide use data during the 1979 crop year as part of the Cotton Objective Yield Survey. A total of 2,027 cotton farm operators responded to the survey. The States are listed below, along with the number of sample observations for each State.

<u>State</u>	<u>Completed questionnaires</u>
Alabama	104
Arizona	88
Arkansas	198
California	232



Georgia	67
Louisiana	107
Mississippi	334
New Mexico	57
Oklahoma	85
South Carolina	75
Tennessee	95
Texas	<u>585</u>

TOTAL	2,027
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The major cotton growing regions in the United States are delineated as follows:

<u>Southeast</u>	<u>Delta</u>	<u>Southern Plains</u>	<u>Far West</u>
Alabama	Arkansas	Oklahoma	Arizona
Georgia	Louisiana	Texas	California
South Carolina	Mississippi		New Mexico
	Tennessee		

The sample size by region was as follows: Southeast, 246; Delta, 734; Southern Plains, 670; and Far West, 377.

Sample fields for each State were randomly selected from growers who reported through the June Enumerative Survey that they had planted or intended to plant cotton in 1979. Each acre had an equal probability of being selected so that the probability of a field being chosen was directly correlated with its size.

After the information was collected and validated the survey data were expanded to State level estimates. These State level estimates were then aggregated to regional and U.S. totals.

Several important definitions are as follows:

Acres treated - the number of acres receiving a specific pesticide application one or more times.

Number of applications - the number of times the specific pesticide was applied to one acre.

Acre-treatments - the number of acres treated times the number of applications of the material.

Rate per season - the total amount of pesticide applied during the growing season. It is found by dividing total pounds active ingredient (a.i.) by acres treated.

Rate per acre-treatment - the dosage rate per application. It is found by dividing total pounds of active ingredient by the number of acre-treatments.

Active ingredient - the portion of the pesticide product which controls the pest.

Pesticide application rates vary as a result of weather conditions, soil type, and weed spectrum. Herbicide application rates are generally expressed as broadcast rates. The amount of a material applied on an acre in either a band or spot application is generally one-fourth to one-third the amount in a broadcast application. The application rate listed for each material in this report is an aggregation of band, broadcast, and spot applications.

#### RELIABILITY OF ESTIMATES

Estimates based upon sample surveys have varying degrees of statistical reliability. Confidence in data depends upon sample size, sampling methods, and the variability of the responses. To provide the user of the data some indication of the reliability of the estimates, coefficients of variation (CV's) are presented in Appendix Table 1. The CV is a measure of relative variation (expressed in percentage terms) and can be used to indicate the degree of confidence a user can place in the estimate. The smaller the CV, the more reliable the estimate.

In simplest terms, one can be 95 percent confident that the sample represents the true population and that the true value for the population lies within

an interval defined as  $\pm 2$  CV's times the estimated value. For example, with a CV of 10 percent and an estimate of 40, the interval would be 32 to 48. However, there is also a 5 percent chance that the true value does not fall within the interval as defined above because the sample is not representative of the population.

CV's were calculated only for acres treated with specific pesticides. The estimates of acres treated are expected to have greater variation than other data reported. Consequently, for most other information included in this report, the level of reliability should be equal to or greater than reported for acres treated.

#### U.S. COTTON HERBICIDE USE

Approximately 14 million acres of cotton were planted in the United States in 1979. Of this total, close to 13 million acres were harvested, with an average yield of 547 pounds of lint per acre. In the 12 States surveyed for pesticide use 13.8 million acres of cotton were planted (Table 1). The largest production area for cotton in terms of both area harvested and production is the Southern Plains, encompassing Oklahoma and Texas. The Southern Plains produced approximately 41 percent (6.1 million bales) of the cotton grown in 1979. The next leading production area was the Far West, comprised of Arizona, California, and New Mexico, with approximately 34 percent (4.9 million bales) of the total production. The Delta and Southeast regions had approximately 20 and 5 percent (2.9 million and 592,000 bales) of the production, respectively.

A total of approximately 18.6 million pounds (a.i.) of herbicides were applied in 22.9 million acre-treatments in 1979 (Table 2). Of this total, 20.5 million acre-treatments, or 88 percent, were single applications while 2.4 million, or 12 percent, were tank mixtures. Single material herbicides accounted



Table 1. U.S. cotton acreage, production, yield, and value, 1979 a/

Region and State	: Area : : planted : : b/	: Area : : harvested : : b/	: Lint yield : : per acre : : b/	: Production : : b/	: Value : : c/
	-----1000 acres-----		Lbs.	1,000 bales d/	Million dollars
<u>Southeast</u>					
Alabama	310	305	510	324	102
Georgia	155	150	486	152	48
South Carolina	110	109	510	116	37
Total	575	564	504	592	187
<u>Delta</u>					
Arkansas	610	530	549	606	190
Louisiana	470	465	712	690	212
Mississippi	1,090	1,050	657	1,437	438
Tennessee	250	230	357	171	52
Total	2,420	2,275	613	2,904	892
<u>Southern Plains</u>					
Oklahoma	600	580	432	522	150
Texas	7,731	6,831	389	5,539	1,486
Total	8,331	7,411	393	6,061	1,636
<u>Far West</u>					
Arizona	624	618	1,046	1,347	451
California	1,650	1,635	1,000	3,408	1,186
New Mexico	170	141	380	112	38
Total	2,444	2,394	976	4,867	1,675
TOTAL, STATES SURVEYED	13,770	12,644	548	14,424	4,390
U.S. TOTAL <u>e/</u>	13,978	12,831	547	14,629	4,450

a/ The States listed are those included in the "1979 Cotton Pesticide Use Survey," USDA, ESCS, Natural Resource Economics Division. The data include Upland and American-Pima cotton.

b/ "Crop Production-1980 Annual Summary," USDA, ESS, Crop Reporting Board, CrPr 2-1(81), January 14, 1981.

c/ "Crop Values-1978-1979-1980," USDA, ESS, Crop Reporting Board, CrPr 2-1(81), January 22, 1981. Value is for lint cotton only.

d/ Standard bale equals 480 pounds net weight.

e/ U.S. totals include data for Florida, Missouri, Nevada, North Carolina, and Virginia.

Table 2. Herbicide use on cotton in the United States: Acres treated, acre-treatments, rates and quantities used, single ingredient and tank-mix applications, 1979 a/

Herbicides	: Acres :		:Pounds of active ingredient:				No. of applica-
	: treated :	Acres-	:	Per			
	: b/ :	treatments :	Total :	Season :	Treatment :		tions
-----Thousand-----							
<u>c/</u>							
<u>Single materials</u>							
Cyanazine	588 (6)	650	399	0.7	0.6		1.1
Diuron	397 (10)	425	276	.7	.6		1.1
DNBP	319 (9)	534	310	1.0	.6		1.7
DSMA	752 (6)	903	1,345	1.8	1.5		1.2
Fluometuron	2,094 (3)	2,338	1,629	.8	.7		1.1
Glyphosate	1,090 (9)	1,524	1,402	1.3	.9		1.4
MSMA	873 (7)	1,372	1,406	1.6	1.0		1.6
Pendimethalin	544 (8)	544	431	.8	.8		1.0
Profluralin	498 (13)	530	430	.9	.8		1.1
Prometryn	931 (10)	938	890	1.0	.9		1.0
Trifluralin	9,496 (2)	9,991	6,366	.7	.6		1.1
Other	-	752	685	-	.9		-
Total	-	20,501	15,569	-	.8		-
<u>Tank mixtures</u>							
Fluometuron	490 (7)	874	340	.7	.4		1.8
+ MSMA			590	1.2	.7		
MSMA	266 (18)	336	254	1.0	.8		1.3
+ prometryn			75	.3	.2		
MSMA	310	500	311	1.0	.6		1.6
+ other <u>d/</u>			463	1.5	.9		
DSMA	252	402	374	1.5	.9		1.6
+ other			236	.9	.6		
Other	-	326	364	-	1.1		-
Total	-	2,438	3,007	-	1.2		-
TOTAL HERBICIDES	-	22,939	18,576	-	.8		-

a/ "1979 Cotton Pesticide Use Survey", USDA, ESCS, Natural Resource Economics Division.

b/ Acres treated data in this column not reported for "other" and "total" because two or more materials may have been used on the same acre resulting in double counting.

c/ Coefficients of variation for acres treated (in percent) are in parentheses. The coefficient of variation is the standard error of the estimate multiplied by 100 and divided by the estimate. The coefficient is a measure of reliability; the lower the coefficient, the more reliable is the estimate.

d/ Includes 16 other herbicides.

for 15.6 million pounds (a.i.) and tank mixtures 3.0 million pounds (a.i.).

The major materials used as single applications were: fluometuron, glyphosate, MSMA, and trifluralin. Trifluralin was used extensively in all regions and accounted for 49 percent of the single material acre-treatments. Fluometuron (11 percent) and MSMA (7 percent) were prominent in the Southeast and Delta regions. Glyphosate accounted for 7 percent of the acre-treatments, with most of it being applied in the Southern Plains. Tank mixtures accounted for about 10 percent of the herbicide acre-treatments. About 37 percent of all tank mixtures were a combination of MSMA and fluometuron and used primarily in the Southeast and Delta regions. MSMA was also tank-mixed with many other herbicides for a total of 26 percent of the acre-treatments. Tank mixtures were relatively unimportant in the Southern Plains and Far West regions.

Single material rates ranged from 0.6 to 1.5 pounds (a.i.) per acre-treatment. The average number of applications for single materials ranged from 1.0 to 1.7 times. Tank mixture rates for individual ingredients ranged from 0.2 to 1.1 pounds (a.i.) per acre-treatment. The average number of applications for tank mixtures ranged from 1.3 to 1.8 times.

Weed species vary between regions. Within regions the weed problems vary with respect to the magnitude of the problem. The most common species are cocklebur, morningglory, crabgrass, Johnsongrass, and nutsedge (1).

Trifluralin, the most commonly used herbicide, is applied as a preplant, broadcast, soil-incorporated treatment. Fluometuron was applied as a band application at planting in the Delta and in the pre-bloom period in the Southeast. Prometryn was applied most commonly at planting in the Southern Plains as a band application (1).



## SOUTHEAST REGION

The Southeast region is composed of three States: Alabama, Georgia, and South Carolina. The region had a total of 564,000 acres of cotton harvested in 1979 (Table 1). Alabama had 305,000 acres (54 percent), Georgia 150,000 acres (27 percent), and South Carolina 109,000 acres (19 percent).

Herbicide usage in the Southeast totaled 1.7 million pounds (a.i.) (Table 3). Single application herbicides accounted for 1.5 million pounds, or 88 percent of the total. Tank mixtures accounted for 240,000 pounds (12 percent).

Acre-treatments totaled 1.7 million, of which 1.5 million (90 percent) were single material applications. Tank mixtures accounted for 173,000 acre-treatments (10 percent).

Herbicide use patterns were similar throughout the Southeast region. In Alabama, Georgia, and South Carolina, the two most frequently used herbicides were trifluralin and fluometuron. Trifluralin accounted for 31 percent of the acre-treatments followed by fluometuron at 28 percent. Other herbicides commonly used in single material applications included DSMA and MSMA.

Tank mixtures were also predominantly combinations of DSMA plus other herbicides and MSMA plus other herbicides. DSMA was often used in conjunction with fluometuron, while MSMA was used with a variety of herbicides, each of which amounted to a relatively small number of acre-treatments.

Total pounds of herbicides (a.i.) for all applications was led by DSMA with 453,000 (27 percent), followed by fluometuron with 368,000 (22 percent) and trifluralin with 293,000 (17 percent). Tank mixtures of DSMA plus other herbicides comprised 3 percent of the total pounds (a.i.) and MSMA plus other herbicides accounted for 8 percent.

Rates per acre-treatment ranged from 0.3 pound (a.i.) for linuron and prometryn to 1.9 pounds (a.i.) for DSMA. Average number of applications

Table 3. Herbicide use on cotton in the Southeast: Acres treated, acre-treatments, rates and quantity used, single ingredient and tank-mix applications, 1979 a/

Herbicide	: Acres	:	:Pounds of active ingredient:		: No. of	
	:treated	: Acre-	:	: Per	: applica-	:
	: b/	:treatments:	Total	: Season	:Treatment	: tions
-----Thousand-----						
<u>Single materials</u>						
Cyanazine	85.2	85.2	52.7	0.6	0.6	1.0
Diuron	23.9	23.9	16.0	.7	.7	1.0
DSMA	163.5	234.5	453.2	2.8	1.9	1.4
Fluometuron	377.5	419.4	368.3	1.0	.9	1.1
Linuron	23.9	33.3	10.0	.4	.3	1.4
MSMA	87.5	111.7	187.3	2.1	1.7	1.3
Norflurazon	28.3	28.3	21.6	.8	.8	1.0
Pendimethalin	45.6	45.6	26.3	.6	.6	1.0
Profluralin	29.3	29.3	20.6	.7	.7	1.0
Prometryn	25.4	25.4	8.1	.3	.3	1.0
Trifluralin	460.0	460.2	292.8	.6	.6	1.0
Other	-	10.9	7.2	-	.7	-
Total	-	1,507.7	1,464.1	-	1.0	-
<u>Tank mixtures</u>						
DSMA	24.9	31.1	28.5	1.1	.9	1.2
+ other			17.0	.7	.5	
MSMA	71.9	91.6	90.6	1.3	1.0	1.3
+ other			52.6	.7	.6	
Other	-	50.1	50.6	-	1.0	-
Total	-	172.8	239.3	-	1.4	-
TOTAL HERBICIDES	-	1,680.5	1,703.4	-	1.0	-

a/ "1979 Cotton Pesticide Use Survey," USDA, ESCS, Natural Resource Economics Division. Coefficients of variation for acres treated and the State data are presented in Appendix A.

b/ Acres treated data in this column not reported for "other" and "total" because two or more materials may have been used on the same acre resulting in double counting.

ranged from 1.0 to 1.4 times per season.

Herbicides were used to control a number of major weed species in the Southeast region. Among these species were cocklebur, morningglory, Johnson-grass, nutsedge, and crabgrass (1).

The four major herbicides used in the Southeast to control these weed species were used under different schedules and application methods. DSMA was applied at planting as a broadcast treatment, either soil-incorporated or surface applied, to control broadleaf weeds. DSMA was also used to control grasses and was applied pre-bloom in a band application. Fluometuron was used predominantly against broadleaf and grass species and applied at planting or pre-bloom in a band application. MSMA tank mixtures were used almost exclusively in a pre-bloom band application. Trifluralin was used exclusively as a pre-plant, broadcast, soil-incorporated application against broadleaf and grass species (1).

#### DELTA REGION

The Delta region is comprised of four States: Arkansas, Louisiana, Mississippi, and Tennessee. The region had a total of 2.3 million acres of cotton harvested in 1979 (Table 1). Mississippi had 1.1 million acres (47 percent), Arkansas 530,000 acres (23 percent), Louisiana 465,000 acres (20 percent), and Tennessee 230,000 acres (10 percent).

Herbicide usage in the Delta region totaled 7.4 million pounds of active ingredient (Table 4). Single application herbicides accounted for close to 5 million pounds (a.i.), while tank mixtures accounted for nearly 2.5 million pounds (a.i.).

Acre-treatments totaled 9.2 million, of which 7.2 million, or approximately 78 percent, were single material applications. Tank mixtures accounted for



Table 4. Herbicide use on cotton in the Delta: Acres treated, acre-treatments, rates and quantity used, single ingredient and tank-mix applications, 1979 a/

Herbicide	: Acres	:	:Pounds of active ingredient:	No. of		
	:treated	: Acre-	:	Per	:applica-	
	: b/	:treatments:	Total	: Season	:Treatment	: tions
-----Thousand-----						
<u>Single materials</u>						
Cyanazine	502.6	565.3	346.1	0.7	0.6	1.1
Diuron	276.3	304.6	170.8	.6	.6	1.1
DNBP	319.0	534.4	310.0	1.0	.6	1.7
DSMA	485.1	535.8	680.7	1.4	1.3	1.1
Fluchloralin	78.0	78.0	62.5	.8	.8	1.0
Fluometuron	1,561.5	1,756.6	1,123.0	.7	.6	1.1
Glyphosate	198.4	266.8	136.1	.7	.5	1.3
MSMA	607.1	890.6	784.2	1.3	.9	1.5
Pendimethalin	139.7	139.7	88.2	.6	.6	1.0
Profluralin	96.7	96.7	68.1	.7	.7	1.0
Prometryn	73.9	80.3	46.3	.6	.6	1.1
Trifluralin	1,742.5	1,754.7	1,048.5	.6	.6	1.0
Other	-	163.1	89.9	-	.6	-
Total	-	7,166.6	4,954.4	-	.7	-
<u>Tank mixtures</u>						
Fluormeturon	459.7	830.1	282.3	.6	.3	1.8
+ MSMA			556.9	1.2	.7	
MSMA	427.6	681.7	450.4	1.1	.7	1.6
+ other			492.1	1.2	.7	
Other	-	555.4	679.8	-	1.2	-
Total	-	2,067.2	2,461.5	-	1.2	-
TOTAL HERBICIDES	-	9,233.8	7,415.9	-	.8	-

a/ "1979 Cotton Pesticide Use Survey," USDA, ESCS, Natural Resource Economics Division. Coefficients of variation for acres treated and the State data are presented in Appendix B.

b/ Acres treated data in this column not reported for "other" and "total" because two or more materials may have been used on the same acre resulting in double counting.

2.1 million acre-treatments, or 22 percent.

Herbicide use patterns were similar throughout the Delta region. In all four States the two major herbicides were trifluralin and fluometuron. Arkansas also used significant amounts of MSMA, DNBP, and cyanazine. There was significant use of MSMA in Louisiana. Mississippi used a diverse spectrum of herbicides, including MSMA, DNBP, and cyanazine. Tennessee used DSMA extensively. Fluometuron and trifluralin each accounted for approximately 25 percent of single material acre-treatments. MSMA, cyanazine, DNBP, and DSMA were each used on less than 12 percent of the single material acre-treatments.

The predominant tank mixes were MSMA plus fluometuron and MSMA plus other herbicides. MSMA plus fluometuron accounted for 40 percent of all tank-mix acre-treatments, while MSMA plus other herbicides accounted for 33 percent. Other tank mixtures accounted for 27 percent and were comprised of six different mixtures.

Total pounds of active ingredients for all applications was led by fluometuron with 1.4 million pounds (a.i.), or 19 percent of the total. Trifluralin had 1.0 million pounds or 13 percent. Other important materials in terms of total pounds (a.i.) applied were MSMA at 784,000 pounds (11 percent) and MSMA (tank-mixed with fluometuron) at 557,000 pounds (8 percent).

Rates per acre-treatment ranged from 0.3 pound (a.i.) for fluometuron (tank-mixed with MSMA) to 1.3 pounds (a.i.) for DSMA. The number of applications ranged from 1.0 to 1.8 times per season.

The major weed species in the Delta are spurred anoda, cocklebur, morning-glory, crabgrass, and Johnsongrass (1). The major herbicides in the Delta, fluometuron, trifluralin, and MSMA, were generally used under different application and timing schedules. Fluometuron was applied mainly at planting in a band application. Trifluralin was applied mainly as a preplant, broadcast,

soil-incorporated herbicide, and MSMA was applied mainly as a band application pre-bloom.

#### SOUTHERN PLAINS REGION

The Southern Plains region is comprised of Oklahoma and Texas. A total of 8.3 million acres of cotton was planted in this region in 1979 (Table 1). Of this total, 7.7 million acres (93 percent) were planted in Texas, while 600,000 acres (7 percent) were planted in Oklahoma.

Herbicide usage in this region totaled 7.2 million pounds of active ingredients (Table 5). Single application herbicides accounted for 7.0 million pounds (a.i.) or 97 percent. Tank mixtures accounted for 230,000 pounds (a.i.) or 3 percent. Acre-treatments totaled 9.7 million, of which 9.6 million (99 percent) were single materials. Tank mixtures accounted for 149,000 acre-treatments or 1 percent.

Herbicide use patterns were similar in both Oklahoma and Texas. In both States the major herbicide used was trifluralin with 6.6 million acre-treatments. Glyphosate was used in 1.1 million acre-treatments, and prometryn in 709,000 acre-treatments. All of this use was in Texas. Tank mixtures included MSMA plus prometryn and prometryn plus other herbicides.

Total quantity of active ingredients applied as single material herbicides was led by trifluralin with 4.1 million pounds (a.i.), or 58 percent. Glyphosate totaled 1.1 million pounds (a.i.) (16 percent), and prometryn accounted for 694,000 pounds (a.i.) (10 percent).

Rates per acre-treatment ranged from 0.6 for trifluralin to 2.7 for prometryn tank-mixed with other herbicides. Average number of applications ranged from 1.0 to 2.2 times per season.

In the Southern Plains, herbicides were used to control a number of weed



Table 5. Herbicide use on cotton in the Southern Plains: Acres treated, acre-treatments, rates and quantity used, single ingredient and tank-mix applications, 1979 a/

Herbicide	: Acres :		:Pounds of active ingredient:		: No. of	
	:treated :	Acre-	:	Per	: applica-	
	: b/	:treatments:	Total	:Season	:Treatment	: tions
----- <u>Thousand</u> -----						
<u>Single materials</u>						
Dipropetryn	110.6	110.6	94.7	0.9	0.9	1.0
DSMA	103.0	132.4	211.1	2.0	1.6	1.3
Fluometuron	154.5	161.8	137.5	.9	.8	1.0
Glyphosate	774.7	1,065.7	1,111.7	1.4	1.0	1.4
MSMA	136.5	294.9	311.8	2.3	1.1	2.2
Profluralin	305.5	337.8	276.6	.9	.8	1.1
Prometryn	708.5	708.5	694.4	1.0	1.0	1.0
Trifluralin	6,161.2	6,629.3	4,067.2	.7	.6	1.1
Other	-	141.2	78.2	-	.6	-
Total	-	9,582.2	6,983.2	-	.7	-
<u>Tank mixtures</u>						
MSMA	97.4	97.4	72.9	.7	.7	1.0
+ prometryn			18.2	.2	.2	
Prometryn	51.4	51.4	69.1	1.3	1.3	1.0
+ other			69.4	1.4	1.4	
Total	-	148.8	229.6	-	1.5	-
TOTAL HERBICIDES	-	9,731.0	7,212.8	-	.7	-

a/ "1979 Cotton Pesticide Use Survey," USDA, ESCS, Natural Resource Economics Division. Coefficients of variation for acres treated and the State data are presented in Appendix C.

b/ Acres treated data in this column not reported for "other" and "total" because two or more materials may have been used on the same acre resulting in double counting.

species including spurred anoda, cocklebur, morningglory, smartweed, teaweed, and annual and perennial grasses (1). The major herbicides used in this region (prometryn, trifluralin, and glyphosate) were generally used under different treatment schedules. Trifluralin was utilized as a preplant, broadcast, soil-incorporated herbicide. Prometryn was used mainly as a band treatment at planting. Glyphosate was applied prior to crop emergence and as a spot application during the post-bloom portion of the growing season (1).

#### FAR WEST

The Far West region is comprised of Arizona, California, and New Mexico. The region had a total of 2.4 million acres of cotton harvested in 1979 (Table 1). California had 1.6 million acres (68 percent); Arizona 618,000 acres (26 percent); and New Mexico 141,000 acres (6 percent).

Herbicide usage in the Far West totaled approximately 2.2 million pounds (a.i.) (Table 6). Single application herbicides accounted for 97 percent of the total. Tank mixtures accounted for nearly 80,000 pounds (a.i.), or 3 percent.

Acre-treatments totaled 2.3 million. Single material acre-treatments accounted for 2.2 million, or 96 percent. Tank mixtures accounted for 4 percent of the total acre-treatments.

In California and Arizona the two major herbicides used were trifluralin and pendimethalin. In New Mexico the major herbicides were glyphosate and trifluralin. On a regional basis trifluralin accounted for 51 percent of single material acre-treatments. The other commonly used herbicides included pendimethalin, accounting for 15 percent of the acre-treatments, and prometryn, accounting for 5 percent. Of the seven other materials used as single material applications, none accounted for more than 5 percent of the single material acre-treatments.

Table 6. Herbicide use on cotton in the Far West: Acres treated, acre-treatments, rates and quantity used, single ingredient and tank-mix applications, 1979 a/

Herbicide	: Acres	:	:Pounds of active ingredient:		: No. of	
	:treated	: Acre-	:	: Per	: applica-	:
	: b/	:treatments:	Total	:Season	:Treatment	: tions
----- <u>Thousand</u> -----						
<u>Single materials</u>						
DCPA	55.9	55.9	175.3	3.1	3.1	1.0
Dinitramine	48.3	48.3	27.1	.6	.6	1.0
Diuron	96.6	96.6	89.2	.9	.9	1.0
Fluchloralin	13.8	13.8	15.5	1.1	1.1	1.0
Glyphosate	116.8	191.4	154.5	1.3	.8	1.6
MSMA	42.2	74.8	123.2	2.9	1.6	1.8
Pendimethalin	358.2	358.2	316.1	.9	.9	1.0
Profluralin	66.3	66.3	65.0	1.0	1.0	1.0
Prometryn	123.5	123.5	141.1	1.1	1.1	1.0
Trifluralin	1,132.4	1,146.9	957.6	.8	.8	1.0
Other	-	68.7	103.0	-	1.5	-
Total	-	2,244.4	2,167.6	-	1.0	-
<u>Tank mixtures</u>						
Prometryn	20.0	20.0	18.5	.9	.9	1.0
+ trifluralin			10.7	.5	.5	
Other	-	28.8	47.7	-	1.7	-
Total	-	48.8	76.9	-	1.6	-
TOTAL HERBICIDES	-	2,293.2	2,244.5	-	1.0	-

a/ "1979 Cotton Pesticide Use Survey," USDA, ESCS, Natural Resource Economics Division. Coefficients of variation for acres treated and the State data are presented in Appendix D.

b/ Acres treated data in this column not reported for "other" and "total" because two or more materials may have been used on the same acre resulting in double counting.



Tank mixture acre-treatments were predominantly prometryn plus trifluralin (41 percent) and other tank-mixed herbicides accounted for 59 percent. These other tank mixtures were composed of separate combinations, including fluometuron, MSMA, and pendimethalin.

Total pounds of active ingredients for all applications was led by trifluralin, with 958,000 pounds (a.i.), or 43 percent of the total. Pendimethalin totaled 316,000 pounds (14 percent) and prometryn 141,000 pounds (6 percent). Tank mixtures accounted for 3 percent of the total pounds (a.i.).

Rates per acre-treatments ranged from 0.6 pound (a.i.) for dinitramine to 3.1 pounds (a.i.) for single applications of DCPA.

The major weed species in the Far West were morningglory, cocklebur, crabgrass, and Johnsongrass (1). The three major herbicides used to control these weed species, trifluralin, pendimethalin, and prometryn, were used under different schedules and application methods. Trifluralin was used as a pre-plant, broadcast, soil-incorporated herbicide against both broadleaf and grass species. Pendimethalin was used against broadleaf and grass species in a preplant, broadcast, soil-incorporated application. Prometryn was used mainly against broadleaf species as a pre- or post-bloom, broadcast, non-incorporated herbicide (1).

## U.S. COTTON DEFOLIANT AND DESICCANT USE

Defoliants and desiccants are often used to facilitate mechanical harvesting. Defoliants cause the leaves to drop while they are still green while desiccants cause the leaves to dry out completely and then drop off.

A total of approximately 9.2 million acre-treatments were made with defoliants and desiccants in 1979 (Table 7). Of this total, 8.1 million acre-treatments, or 88 percent, were single material applications. Tank mixtures accounted for 1.1 million acre-treatments (12 percent).

Total quantity was 23.2 million pounds (a.i.). Single materials accounted for 19.8 million, or 85 percent. Tank mixtures accounted for 3.4 million pounds (a.i.), or 15 percent. Rates per acre-treatment ranged from 0.2 pound (a.i.) for endothall to 4.6 pounds (a.i.) for sodium chlorate. Number of applications ranged from 1.0 to 1.2 times per season.

In the Southeast the major defoliant used in all three States was DEF (Appendix E). In the Delta the predominant defoliant was DEF, however, sodium chlorate was used extensively in Mississippi. Arsenic acid (a desiccant) was the dominant material used in the Southern Plains. The defoliants, DEF and sodium chlorate, were also used. In the Far West the major defoliants used were DEF and sodium chlorate.

Table 7. Defoliant and desiccant use on cotton in the United States: Acres treated, acre-treatments, rates and quantities used, single ingredient and tank-mix applications, 1979 a/

Defoliant and desiccant	: Acres :		:Pounds of active ingredient: No. of			
	: treated	: Acre-	: : Per	: applica-		
	: b/	: treatments:	Total	:Season	: Treatment	: tions
-----Thousand-----						
<u>c/</u>						
<u>Single materials</u>						
Arsenic acid	1,654 (8)	1,677	6,744	4.1	4.0	1.0
Cacodylic acid	225 (2)	235	120	.5	.5	1.0
DEF	3,124 (3)	3,331	4,519	1.4	1.4	1.1
Endothall	301 (17)	322	75	.2	.2	1.1
Magnesium chlorate	90 (11)	111	90	1.0	.8	1.2
Paraquat	611 (11)	699	381	.6	.5	1.1
Sodium chlorate	1,455 (5)	1,692	7,788	5.4	4.6	1.2
Other	-	33	48	-	1.5	-
Total	-	8,100	19,765	-	2.4	-
<u>Tank mixtures</u>						
Arsenic acid	-	36	89	-	2.4	-
+ other			65	-	1.8	
Cacodylic acid	-	89	68	-	.8	-
+ other			78	-	.9	
DEF	362 (13)	421	1,217	3.4	2.9	1.2
+ endothall			186	.5	.4	
DEF	-	191	461	-	2.4	-
+ other			162	-	.8	
Paraquat	157 (21)	157	50	.3	.3	1.0
+ sodium chlorate			462	2.9	2.9	
Other	-	189	555	-	2.9	-
Total	-	1,083	3,393	-	3.1	-
TOTAL DEFOLIANTS/ DESICCANTS	-	9,183	23,158	-	2.5	-

a/ "1979 Cotton Pesticide Use Survey," USDA, ESCS, Natural Resource Economics Division. Regional data are presented in Appendix E.

b/ Acres treated data in this column not reported for "other" and "total" because two or more materials may have been used on the same acre, resulting in double counting.

c/ Coefficients of variation for acres treated (in percent) are in parentheses. The coefficient is the standard error of the estimate multiplied by 100 and divided by the estimate. The coefficient is a measure of reliability; the lower the coefficient, the more reliable is the estimate.



REFERENCES

1. USDA, ESCS, Natural Resource Economics Division, "1979 Cotton Pesticide Use Survey," 1979 (unpublished).
2. USDA, ESS, Crop Reporting Board, "Crop Production-1980 Annual Summary," CrPr 2-1(81), January 14, 1981.
3. USDA, ESS, Crop Reporting Board, "Crop Values-1978-1979-1980," CrPr 2-1(81), January 22, 1981.

APPENDIX A

1979 HERBICIDE USE ON COTTON  
IN THE SOUTHEAST

Table A-1. Coefficients of variation

Table A-2. Alabama

Table A-3. Georgia

Table A-4. South Carolina

Table A-1. Coefficients of variation for cotton acres treated with single ingredient herbicides, Southeast region and States, 1979 a/

Herbicide	:	Alabama	:	Georgia	:	South Carolina	:	Region
	:		:		:		:	
----- <u>Percent</u> -----								
<u>Single materials</u>								
Cyanazine		20		49		31		17
Diuron		-		-		22		22
DSMA		11		49		15		9
Fluchloralin		57		-		-		<u>c/</u>
Fluometuron		7		9		10		<u>5</u>
Linuron		34		-		57		29
MSMA		20		27		-		16
Norflurazon		44		49		<u>b/</u>		32
Pendimethalin		26		<u>b/</u>		70		24
Profluralin		40		-		36		29
Prometryn		-		27		-		28
Trifluralin		6		3		7		3

- None reported.

a/ "1979 Cotton Pesticide Use Survey," USDA, ESCS, Natural Resource Economics Division.

b/ Use of this material at the State level was not significant and was reported in the "other" category.

c/ Use of this material at the regional level was not significant and was reported in the "other" category.



Table A-2. Herbicide use on cotton in Alabama: Acres treated, acre-treatments, rates and quantities used, single ingredient and tank-mix applications, 1979 a/

Herbicides	: Acres	:	:Pounds of active ingredient:			No. of
	:treated	: Acre-	:	: Per		: applica-
	: b/	:treatments	: Total	:Season	:Treatment	: tions
----- <u>Thousand</u> -----						
<u>Single materials</u>						
Cyanazine	62.5	62.5	40.8	0.7	0.7	1.0
DSMA	117.1	174.4	331.9	2.8	1.9	1.5
Fluchloralin	9.4	9.4	6.6	.7	.7	1.0
Fluometuron	199.9	215.7	161.8	.8	.8	1.1
Linuron	19.4	28.8	7.8	.4	.3	1.5
MSMA	62.1	63.1	118.6	1.9	1.9	1.0
Norflurazon	17.5	17.5	13.6	.8	.8	1.0
Pendimethalin	40.3	40.3	22.5	.6	.6	1.0
Profluralin	18.8	18.8	12.8	.7	.7	1.0
Trifluralin	227.0	227.0	117.4	.5	.5	1.0
Total	-	857.5	833.8	-	1.0	-
<u>Tank mixtures</u>						
DSMA	24.9	31.1	28.5	1.1	.9	1.2
+ other			17.0	.7	.5	
MSMA	25.0	31.3	14.9	.6	.5	1.3
+ other			14.1	.6	.5	
Other	-	12.5	4.0	-	.3	-
Total	-	74.9	78.5	-	1.0	-
TOTAL HERBICIDES	-	932.4	912.3	-	1.0	-

a/ "1979 Cotton Pesticide Use Survey," USDA, ESCS, Natural Resource Economics Division.

b/ Data in this column for "other" and "total" were not reported because two or more materials may have been used on the same acre resulting in multiple counting.

Table A-3. Herbicide use on cotton in Georgia: Acres treated, acre-treatments, rates and quantities used, single ingredient and tank-mix applications, 1979 a/

	: Acres :		:Pounds of active ingredient:	No. of		
Herbicides	: treated :	Acre-	:	Per	: applica-	
	: b/ :	treatments	: Total	:Season	:Treatment	: tions
<hr/>						
	----- <u>Thousand</u> -----					
<hr/>						
<u>Single materials</u>						
Cyanazine	9.3	9.3	7.3	0.8	0.8	1.0
DSMA	4.6	9.3	20.8	4.5	2.2	2.0
Fluometuron	98.5	121.6	153.0	1.6	1.3	1.2
MSMA	25.4	48.6	68.7	2.7	1.4	1.9
Norflurazon	9.3	9.3	7.4	.8	.8	1.0
Prometryn	25.4	25.4	8.1	.3	.3	1.0
Trifluralin	147.9	148.1	106.3	.7	.7	1.0
Other	-	2.3	2.3	-	1.0	-
Total	-	373.9	373.9	-	1.0	-
<hr/>						
<u>Tank mixtures</u>						
MSMA	18.5	18.5	11.5	.6	.6	1.0
+ other			6.2	.3	.3	
Other	-	30.1	30.0	-	1.0	-
Total	-	48.6	47.7	-	1.0	-
TOTAL HERBICIDES	-	422.5	421.6	-	1.0	-

a/ "1979 Cotton Pesticide Use Survey," USDA, ESCS, Natural Resource Economics Division.

b/ Data in this column for "other" and "total" were not reported because two or more materials may have been used on the same acre resulting in multiple counting.

Table A-4. Herbicide use on cotton in South Carolina: Acres treated, acre-treatments, rates and quantities used, single ingredient and tank-mix applications, 1979 a/

Herbicides	: Acres	:	:Pounds of active ingredient:			No. of
	:treated	: Acre-	:	: Per	:	applica-
	: b/	:treatments	: Total	:Season	:Treatment	: tions
----- <u>Thousand</u> -----						
<u>Single materials</u>						
Cyanazine	13.4	13.4	4.6	0.3	0.3	1.0
Diuron	23.9	23.9	16.0	.7	.7	1.0
DSMA	41.8	50.8	100.5	2.4	2.0	1.2
Fluometuron	79.1	82.1	53.5	.7	.7	1.0
Linuron	4.5	4.5	2.2	.5	.5	1.0
Pendimethalin	3.0	3.0	1.5	.5	.5	1.0
Profluralin	10.5	10.5	7.8	.8	.8	1.0
Trifluralin	85.1	85.1	69.1	.7	.7	1.0
Other	-	3.0	1.2	-	.4	-
Total	-	276.3	256.4	-	.9	-
<u>Tank mixtures</u>						
MSMA	28.4	41.8	64.2	2.3	1.5	1.5
+ other			32.3	1.1	.8	
Other	-	7.5	16.6	-	2.2	-
Total	-	49.3	113.1	-	2.3	-
TOTAL HERBICIDES	-	325.6	369.5	-	1.1	-

a/ "1979 Cotton Pesticide Use Survey," USDA, ESCS, Natural Resource Economics Division.

b/ Data in this column for "other" and "total" were not reported because two or more materials may have been used on the same acre resulting in multiple counting.



APPENDIX B

1979 HERBICIDE USE ON COTTON  
IN THE DELTA

Table B-1. Coefficients of variation

Table B-2. Arkansas

Table B-3. Louisiana

Table B-4. Mississippi

Table B-5. Tennessee

Table B-1. Coefficients of variation for cotton acres treated with single ingredient and tank-mix herbicide applications, Delta region and States, 1979 a/

Herbicide	:	:	:	:	:
	: Arkansas	: Louisiana	: Mississippi	: Tennessee	: Region
	:	:	:	:	:
----- <u>Percent</u> -----					
<u>Single materials</u>					
Cyanazine	9	30	9	74	6
Dinitramine	79	-	58	-	<u>c/</u>
Diuron	40	44	10	<u>b/</u>	10
DNBP	12	-	12	-	9
DSMA	16	16	15	9	7
Fluchloralin	-	-	20	<u>b/</u>	20
Fluometuron	4	6	5	<u>5</u>	2
Glyphosate	31	40	16	32	12
Linuron	30	-	18	-	<u>c/</u>
Methazole	53	-	-	-	<u>c/</u>
MSMA	11	13	9	39	6
Norflurazon	26	-	12	-	<u>c/</u>
Pendimethalin	19	70	15	49	11
Profluralin	40	34	30	57	19
Prometryn	29	40	41	-	21
Trifluralin	5	4	3	5	2
<u>Tank mixtures</u>					
Fluometuron + MSMA	11	22	12	<u>b/</u>	7
DNBP + MSMA	-	<u>b/</u>	16	-	<u>c/</u>
MSMA + prometryn	<u>b/</u>	<u>b/</u>	17	-	<u>c/</u>

- None reported.

a/ "1979 Cotton Pesticide Use Survey," USDA, ESCS, Natural Resource Economics Division.

b/ Use of this material at the State level was not significant and was reported in the "other" category.

c/ Use of this material at the regional level was not significant and was reported in the "other" category.

Table B-2. Herbicide use on cotton in Arkansas: Acres treated, acre-treatments, rates and quantities used, single ingredient and tank-mix applications, 1979 a/

Herbicides	: Acres	:	:Pounds of active ingredient:		No. of	
	:treated	: Acre-	:	: Per	: applica-	
	: b/	:treatments:	Total	: Season	:Treatment	: tions
----- <u>Thousand</u> -----						
<u>Single materials</u>						
Cyanazine	219.5	238.6	128.6	0.6	0.5	1.1
Dinitramine	4.2	4.2	1.5	.4	.4	1.0
Diuron	19.1	19.1	4.5	.2	.2	1.0
DNBP	140.0	245.6	164.1	1.2	.7	1.8
DSMA	93.5	101.5	97.5	1.0	1.0	1.1
Fluometuron	432.4	553.3	354.9	.8	.6	1.3
Glyphosate	31.8	31.8	23.1	.7	.7	1.0
Linuron	31.5	31.5	8.6	.3	.3	1.0
Methazole	9.2	9.2	5.8	.6	.6	1.0
MSMA	165.5	267.3	290.7	1.8	1.1	1.6
Norflurazon	44.5	44.5	41.0	.9	.9	1.0
Pendimethalin	79.5	79.5	43.8	.6	.6	1.0
Profluralin	19.1	19.1	12.7	.7	.7	1.0
Prometryn	28.6	35.0	21.6	.8	.6	1.2
Trifluralin	405.9	409.1	217.8	.5	.5	1.0
Total	-	2,089.3	1,416.2	-	.7	-
<u>Tank mixtures</u>						
Fluometuron	194.1	362.7	130.0	.7	.4	1.9
+ MSMA			264.1	1.4	.7	
DSMA	48.7	82.7	94.0	1.9	1.1	1.7
+ other			48.9	1.0	.6	
Other	-	54.1	58.9	-	1.1	-
Total	-	499.5	595.9	-	1.2	-
TOTAL HERBICIDES	-	2,588.8	2,012.1	-	.8	-

a/ "1979 Cotton Pesticide Use Survey," USDA, ESCS, Natural Resource Economics Division.

b/ Data in this column for "other" and "total" were not reported because two or more materials may have been used on the same acre resulting in multiple counting.



Table B-3. Herbicide use on cotton in Louisiana: Acres treated, acre-treatments, rates and quantities used, single ingredient and tank-mix applications, 1979 a/

Herbicides	: Acres	:	:Pounds of active ingredient:		: No. of	
	:treated	: Acre-	:	: Per	: applica-	
	: b/	:treatments	: Total	:Season	:Treatment	: tions
----- <u>Thousand</u> -----						
<u>Single materials</u>						
Cyanazine	43.9	43.9	32.2	0.7	0.7	1.0
Diuron	22.0	22.0	7.4	.3	.3	1.0
DSMA	123.0	140.6	149.0	1.2	1.1	1.1
Fluometuron	329.4	347.0	203.6	.6	.6	1.1
Glyphosate	26.4	35.1	13.0	.5	.4	1.3
MSMA	162.5	193.3	156.4	1.0	.8	1.2
Pendimethalin	8.8	8.8	8.8	1.0	1.0	1.0
Profluralin	35.1	35.1	19.5	.6	.6	1.0
Prometryn	26.4	26.4	14.8	.6	.6	1.0
Trifluralin	390.7	390.7	300.3	.8	.8	1.0
Total	-	1,242.9	905.0	-	.7	-
<u>Tank mixtures</u>						
Fluometuron	79.1	118.6	44.2	.6	.4	1.5
+ MSMA			97.5	1.2	.8	
Fluometuron	57.1	74.7	54.1	.9	.7	1.3
+ other			65.2	1.1	.9	
Other	-	61.5	79.5	-	1.3	-
Total	-	254.8	340.5	-	1.3	-
TOTAL HERBICIDES	-	1,497.7	1,245.5	-	.8	-

a/ "1979 Cotton Pesticide Use Survey," USDA, ESCS, Natural Resource Economics Division.

b/ Data in this column for "other" and "total" were not reported because two or more materials may have been used on the same acre resulting in multiple counting.

Table B-4. Herbicide use on cotton in Mississippi: Acres treated, acre-treatments, rates and quantities used, single ingredient and tank-mix applications, 1979 a/

Herbicides	: Acres	:	:Pounds of active ingredient:			No. of
	:treated	: Acre-	:	: Per	:	applica-
	: b/	:treatments	: Total	:Season	:Treatment	: tions
----- <u>Thousand</u> -----						
<u>Single materials</u>						
Cyanazine	235.3	278.9	178.9	0.8	0.6	1.2
Dinitramine	9.4	9.4	3.5	.4	.4	1.0
Diuron	232.6	260.9	158.1	.7	.6	1.1
DNBP	179.0	288.8	145.9	.8	.5	1.6
DSMA	128.9	154.0	178.1	1.4	1.2	1.2
Fluchloralin	75.4	75.4	60.5	.8	.8	1.0
Fluometuron	600.0	656.6	409.3	.7	.6	1.1
Glyphosate	116.3	176.0	78.4	.7	.4	1.5
Linuron	10.9	10.9	8.0	.7	.7	1.0
MSMA	264.1	415.0	319.8	1.2	.8	1.6
Norflurazon	53.4	53.4	21.5	.4	.4	1.0
Pendimethalin	40.9	40.9	26.4	.6	.7	1.0
Profluralin	34.6	34.6	28.0	.8	.8	1.0
Prometryn	18.9	18.0	9.9	.5	.5	1.0
Trifluralin	750.2	756.5	450.1	.6	.6	1.0
Total	-	3,230.2	2,076.4	-	.6	-
<u>Tank mixtures</u>						
Fluometuron	178.6	340.9	106.1	.6	.3	1.9
+ MSMA			191.2	1.1	.6	
DNBP	100.4	141.2	72.1	.7	.5	1.4
+ MSMA			101.4	1.0	.7	
MSMA	100.6	166.6	120.6	1.2	.7	1.7
+ prometryn			37.3	.4	.2	
MSMA	226.6	373.9	228.4	1.0	.6	-
+ other			382.7	1.7	1.0	
Other	-	279.8	277.4	-	1.0	-
Total	-	1,302.4	1,517.2	-	1.2	-
TOTAL HERBICIDES	-	4,532.6	3,593.6	-	.8	-

a/ "1979 Cotton Pesticide Use Survey," USDA, ESCS, Natural Resource Economics Division.

b/ Data in this column for "other" and "total" were not reported because two or more materials may have been used on the same acre resulting in multiple counting.

Table B-5. Herbicide use on cotton in Tennessee: Acres treated, acre-treatments, rates and quantities used, single ingredient and tank-mix applications, 1979 a/

	: Acres :		:Pounds of active ingredient:	No. of		
Herbicides	:treated :	Acre-	:	Per	: applica-	
	: b/	: treatments	: Total	: Season	: Treatment	: tions
----- <u>Thousand</u> -----						
<u>Single materials</u>						
Cyanazine	3.9	3.9	6.4	1.6	1.6	1.0
DSMA	139.7	139.7	256.1	1.8	1.8	1.0
Fluometuron	199.7	199.7	155.2	.8	.8	1.0
Glyphosate	23.9	23.9	21.6	.9	.9	1.0
MSMA	15.0	15.0	17.3	1.2	1.2	1.0
Pendimethalin	10.5	10.5	9.2	.9	.9	1.0
Profluralin	7.9	7.9	7.9	1.0	1.0	1.0
Trifluralin	195.7	198.4	80.3	.4	.4	1.0
Other	-	5.2	2.8	-	.5	-
Total	-	604.2	556.8	-	.9	-
<u>Tank mixtures</u>						
Fluometuron	10.5	10.5	3.7	.4	.4	1.0
+ other			4.2	.4	.4	
Total	-	10.5	7.9	-	.8	-
TOTAL HERBICIDES	-	614.7	564.8	-	.9	-

a/ "1979 Cotton Pesticide Use Survey," USDA, ESCS, Natural Resource Economics Division.

b/ Data in this column for "other" and "total" were not reported because two or more materials may have been used on the same acre resulting in multiple counting.



APPENDIX C

1979 HERBICIDE USE ON COTTON  
IN THE SOUTHERN PLAINS

Table C-1. Coefficients of variation

Table C-2. Oklahoma

Table C-3. Texas

Table C-1. Coefficients of variation for cotton acres treated with single ingredient herbicides, Southern Plains region and States, 1979 a/

Herbicide	Oklahoma	Texas	Region
----- Percent -----			
<u>Single materials</u>			
Dinitramine	-	57	c/
Dipropetryn	70	41	37
Diuron	-	57	c/
DSMA	-	26	26
Fluometuron	70	21	21
Glyphosate	b/	12	12
MSMA	70	29	27
Pendimethalin	46	b/	c/
Profluralin	40	21	19
Prometryn	-	12	12
Trifluralin	7	3	2
<u>Tank mixtures</u>			
MSMA			
+ prometryn	-	38	38

- None reported.

a/ "1979 Cotton Pesticide Use Survey," USDA, ESCS, Natural Resource Economics Division.

b/ Use of this material at the State level was not significant and was reported in the "other" category.

c/ Use of this material at the regional level was not significant and was reported in the "other" category.

Table C-2. Herbicide use on cotton in Oklahoma: Acres treated, acre-treatments, rates and quantities used, single ingredient and tank-mix applications, 1979 a/

Herbicides	: Acres	:	:Pounds of active ingredient:		: No. of	
	:treated	: Acre-	:	: Per	: applica-	:
	: b/	:treatments	: Total	:Season	:Treatment	: tions
----- <u>Thousand</u> -----						
<u>Single materials</u>						
Dipropetryn	13.7	13.7	5.5	.4	.4	1.0
Fluometuron	13.7	13.7	3.3	.2	.2	1.0
MSMA	14.1	28.2	37.6	2.7	1.3	2.0
Pendimethalin	26.1	26.1	21.4	.8	.8	1.0
Profluralin	38.5	38.5	31.0	.8	.8	1.0
Trifluralin	397.7	461.2	303.8	.8	.7	1.2
Other	-	21.1	4.8	-	.2	-
TOTAL HERBICIDES	-	602.5	407.4	-	.7	-

a/ "1979 Cotton Pesticide Use Survey," USDA, ESCS, Natural Resource Economics Division.

b/ Data in this column for "other" and "total" were not reported because two or more materials may have been used on the same acre resulting in multiple counting.



Table C-3. Herbicide use on cotton in Texas: Acres treated, acre-treatments, rates and quantities used, single ingredient and tank-mix applications, 1979 a/

Herbicides	: Acres	:	:Pounds of active ingredient:		No. of	
	:treated	: Acre-	:	: Per	: applica-	
	: b/	:treatments	: Total	:Season	:Treatment	: tions
-----Thousand-----						
<u>Single materials</u>						
Dinitramine	22.1	22.1	9.9	0.4	0.4	1.0
Dipropetryn	96.9	96.9	89.2	.9	.9	1.0
Diuron	41.2	44.5	17.8	.4	.4	1.1
DSMA	103.0	132.4	211.1	2.0	1.6	1.3
Fluometuron	140.8	148.1	134.2	1.0	.9	1.1
Glyphosate	767.6	1,044.6	1,106.9	1.4	1.1	1.4
MSMA	122.4	266.7	274.2	2.2	1.0	2.2
Profluralin	267.0	299.3	245.6	.9	.8	1.1
Prometryn	708.5	708.5	694.4	1.0	1.0	1.0
Trifluralin	5,763.5	6,168.1	3,763.4	.7	.6	1.1
Other	-	48.5	29.1	-	.6	-
Total	-	8,979.7	6,575.8	-	.7	-
<u>Tank mixtures</u>						
MSMA	97.4	97.4	72.9	.7	.7	1.0
+ prometryn			18.2	.2	.2	
Prometryn	51.4	51.4	69.1	1.3	1.3	1.0
+ other			69.4	1.4	1.4	
Total	-	148.8	229.6	-	1.5	-
TOTAL HERBICIDES	-	9,128.5	6,805.4	-	.7	-

a/ "1979 Cotton Pesticide Use Survey," USDA, ESCS, Natural Resource Economics Division.

b/ Data in this column for "other" and "total" were not reported because two or more materials may have been used on the same acre, resulting in multiple counting.

APPENDIX D

1979 HERBICIDE USE ON COTTON  
IN THE FAR WEST

Table D-1. Coefficients of variation

Table D-2. Arizona

Table D-3. California

Table D-4. New Mexico

Table D-1. Coefficients of variation for cotton acres treated with single ingredient and tank-mix herbicide applications, Far West region and States, 1979 a/

Herbicide	:	Arizona	:	California	:	New Mexico	:	Region
	:		:		:		:	
----- <u>Percent</u> -----								
<u>Single materials</u>								
Bensulide	-		69	-			<u>c/</u>	
DCPA	-		11	-			<u>11</u>	
Dinitramine	50		57	-				38
Diuron	34		37	<u>b/</u>				25
Fluchloralin	70		-	-				70
Fluometuron	-		51	-			<u>c/</u>	
Glyphosate	42		40	23				<u>25</u>
MSMA	-		44	61				43
Pendimethalin	17		19	<u>b/</u>				13
Profluralin	49		57	<u>39</u>				34
Prometryn	26		42	<u>b/</u>				22
Trifluralin	20		6	<u>16</u>				5
<u>Tank mixtures</u>								
Prometryn								
+ trifluralin	57		-	-				57

- None reported.

a/ "1979 Cotton Pesticide Use Survey," USDA, ESCS, Natural Resource Economics Division.

b/ Use of this material at the State level was not significant and was reported in the "other" category.

c/ Use of this material at the regional level was not significant and was reported in the "other" category.



Table D-2. Herbicide use on cotton in Arizona: Acres treated, acre-treatments, rates and quantities used, single ingredient and tank-mix applications, 1979 a/

Herbicides	: Acres	:	:Pounds of active ingredient:		No. of	
	:treated	: Acre-	:	: Per	: applica-	
	: b/	:treatments	: Total	:Season	:Treatment	: tions
----- <u>Thousand</u> -----						
<u>Single materials</u>						
Dinitramine	25.8	25.8	14.5	.6	.6	1.0
Diuron	53.5	53.5	51.7	1.0	1.0	1.0
Fluchloralin	13.8	13.8	15.5	1.1	1.1	1.0
Glyphosate	34.6	55.4	28.5	.8	.5	1.0
Pendimethalin	180.2	180.2	151.9	.8	.8	1.0
Profluralin	27.7	27.7	20.8	.8	.8	1.0
Prometryn	86.8	86.8	97.1	1.1	1.1	1.0
Trifluralin	138.6	145.6	105.2	.8	.7	1.1
Other	-	20.7	37.4	-	1.8	-
Total	-	609.5	522.6	-	.9	-
<u>Tank mixtures</u>						
Prometryn	20.0	20.0	18.5	.9	.9	1.0
+ trifluralin			10.7	.5	.5	
Other	-	20.7	36.3	-	1.8	-
Total	-	40.7	65.5	-	1.6	-
TOTAL HERBICIDES	-	650.2	588.1	-	.9	-

a/ "1979 Cotton Pesticide Use Survey," USDA, ESCS, Natural Resource Economics Division.

b/ Data in this column for "other" and "total" were not reported because two or more materials may have been used on the same acre resulting in multiple counting.

Table D-3. Herbicide use on cotton in California: Acres treated, acre-treatments, rates and quantities used, single ingredient and tank-mix applications, 1979 a/

	: Acres :		:Pounds of active ingredient:	No. of		
Herbicides	:treated :	Acre-	:	Per	: applica-	
	: b/ :	treatments :	Total :	Season :	Treatment :	tions
	----- <u>Thousand</u> -----					
<u>Single materials</u>						
Bensulide	6.6	6.6	4.9	0.7	0.7	1.0
DCPA	55.9	55.9	175.3	3.1	3.1	1.0
Dinitramine	22.5	22.5	12.6	.6	.6	1.0
Diuron	43.1	43.1	37.5	.9	.9	1.0
Fluometuron	26.7	26.7	48.3	1.8	1.8	1.0
Glyphosate	45.1	52.6	33.4	.7	.6	1.2
MSMA	37.5	67.4	120.0	3.2	1.8	1.8
Pendimethalin	177.2	177.2	163.7	.9	.9	1.0
Profluralin	22.5	22.5	28.1	1.2	1.2	1.0
Prometryn	35.9	35.9	43.2	1.2	1.2	1.0
Trifluralin	932.6	940.1	810.6	.9	.9	1.0
Other	-	6.0	5.6	-	.9	-
Total	-	1,456.5	1,483.2	-	1.0	-
<u>Tank mixtures</u>						
Other	-	4.9	8.2	-	1.7	-
TOTAL HERBICIDES	-	1,461.4	1,491.4	-	1.0	-

a/ "1979 Cotton Pesticide Use Survey," USDA, ESCS, Natural Resource Economics Division.

b/ Data in this column for "other" and "total" were not reported because two or more materials may have been used on the same acre resulting in multiple counting.

Table D-4. Herbicide use on cotton in New Mexico: Acres treated, acre-treatments, rates and quantities used, single ingredient and tank-mix applications, 1979 a/

Herbicides	: Acres	:	:Pounds of active ingredient:		No. of	
	:treated	: Acre-	:	: Per	: applica-	
	: b/	:treatments	: Total	:Season	:Treatment	: tions
----- <u>Thousand</u> -----						
<u>Single materials</u>						
Glyphosate	37.1	83.4	92.6	2.5	1.1	2.2
MSMA	4.7	7.4	3.2	.7	.4	1.6
Profluralin	16.1	16.1	16.1	1.0	1.0	1.0
Trifluralin	61.2	61.2	41.8	.7	.7	1.0
Other	-	10.3	8.1	-	.8	-
Total	-	178.4	161.8	-	.9	-
<u>Tank mixtures</u>						
Other	-	3.2	3.2	-	1.0	-
TOTAL HERBICIDES	-	181.6	165.0	-	.9	-

a/ "1979 Cotton Pesticide Use Survey," USDA, ESCS, Natural Resource Economics Division.

b/ Data in this column for "other" and "total" were not reported because two or more materials may have been used on the same acre resulting in multiple counting.



APPENDIX E

1979 DEFOLIANT AND DESICCANT  
USE ON COTTON

Table E-1. Coefficients of variation

Table E-2. Southeast

Table E-3. Delta

Table E-4. Southern Plains

Table E-5. Far West

Table E-1. Coefficients of variation for cotton acres treated single ingredient and tank-mix applications of defoliant and desiccant: U.S. and region, 1979 <sup>a/</sup>

	:	:	:	Southern :	:
Defoliant/desiccant	:	Southeast	: Delta	: Plains	: Far West : U.S.

- None reported.

<sup>a/</sup> "1979 Cotton Pesticide Use Survey," USDA, ESCS, Natural Resource Economics Division.

Table E-2. Defoliant and desiccant use on cotton in the Southeast: Acres treated, acre-treatments, rates and quantities used, single ingredient and tank-mix applications, 1979 a/

Defoliant/Desiccant	: Acres	:	:Pounds of active ingredient:			No. of
	:treated	: Acre-	:	: Per	:	:applica-
	: b/	:treatments:	Total	:Season	:Treatment	: tions
----- <u>Thousand</u> -----						
<u>Single materials</u>						
Cacodylic acid	11.2	11.2	6.7	.6	.6	1.0
DEF	515.5	515.5	482.0	.9	.9	1.0
Paraquat	6.3	6.3	.7	.1	.1	1.0
Sodium chlorate	18.8	18.8	8.4	.4	.4	1.0
Total	-	551.8	497.8	-	.9	-
<u>Tank mixtures</u>						
DEF	15.6	15.6	5.5	.4	.4	1.0
+ paraquat			1.2	.1	.1	
TOTAL DEFOLIANTS/ DESICCANTS	-	567.4	504.5	-	.9	-

a/ "1979 Cotton Pesticide Use Survey," USDA, ESCS, Natural Resource Economics Division. Includes Alabama, Georgia, and South Carolina.

b/ Data in this column for "other" and "total" were not reported because two or more materials may have been used on the same acre, resulting in multiple counting.

Table E-3. Defoliant and desiccant use on cotton in the Delta: Acres treated, acre-treatments, rates and quantities used, single ingredient and tank-mix applications, 1979 a/

Defoliant/Desiccant	: Acres	:	:Pounds of active ingredient:		No. of	
	:treated	: Acre-	:	: Per	: applica-	:
	: b/	:treatments:	Total	:Season	:Treatment	: tions
-----Thousand-----						
<u>Single materials</u>						
Arsenic acid	6.3	6.3	5.3	.8	.8	1.0
DEF	1,524.3	1,630.9	1,822.4	1.2	1.1	1.1
Magnesium chlorate	9.4	9.4	2.1	.2	.2	1.0
Paraquat	22.0	22.0	14.7	.7	.7	1.0
Sodium chlorate	155.1	180.2	368.0	2.4	2.0	1.2
Total	-	1,848.8	2,212.5	-	1.2	-
<u>Tank mixtures</u>						
DEF	25.0	25.0	18.8	.8	.8	1.0
+ paraquat			11.8	.5	.5	
DEF	-	3.2	3.8	-	1.2	-
+ other			3.6	-	1.1	
Endothall	12.7	12.7	.7	.1	.5	1.0
+ paraquat			6.7	.5	.5	
Total	-	40.9	45.4	-	1.1	1.1
TOTAL DEFOLIANTS/ DESICCANTS	-	1,889.7	2,257.9	-	1.2	-

a/ "1979 Cotton Pesticide Use Survey," USDA, ESCS, Natural Resource Economics Division. Includes Arkansas, Louisiana, Mississippi, and Tennessee.

b/ Data in this column for "other" and "total" were not reported because two or more materials may have been used on the same acre, resulting in multiple counting.



Table E-4. Defoliant and desiccant use on cotton in the Southern Plains:  
Acres treated, acre-treatments, rates and quantities used, single  
ingredient and tank-mix applications, 1979 a/

Defoliant/Desiccant	: Acres	:	:Pounds of active ingredient:		No. of	
	:treated	: Acre-	:	: Per	: applica-	
	: b/	: treatments:	Total	:Season	:Treatment	: tions
----- <u>Thousand</u> -----						
<u>Single materials</u>						
Arsenic acid	1,538.6	1,564.4	6,536.1	4.2	4.2	1.0
Cacodylic acid	88.2	93.3	87.6	1.1	.9	1.1
DEF	365.3	365.3	423.3	1.2	1.2	1.0
Endothall	189.2	189.2	44.8	.2	.2	1.0
Paraquat	312.9	312.9	119.8	.4	.4	1.0
Sodium chlorate	233.5	255.5	855.5	3.7	3.3	1.1
Total	-	2,780.6	8,067.1	-	2.9	-
<u>Tank mixtures</u>						
Arsenic acid	14.7	14.7	37.2	2.5	2.5	1.0
+ sodium chlorate			53.0	3.6	3.6	
DEF	228.0	286.9	402.7	1.8	1.8	1.0
+ endothall			57.5	.3	.3	
Endothall	32.3	32.3	115.6	.4	.4	1.0
+ paraquat			211.6	.7	.7	
Other	-	22.2	69.5	-	3.1	-
Total	-	356.1	947.1	-	2.7	-
TOTAL DEFOLIANTS/ DESICCANTS	-	3,136.7	9,014.2	-	2.9	-

a/ "1979 Cotton Pesticide Use Survey," USDA, ESCS, Natural Resource Economics Division. Includes Oklahoma and Texas.

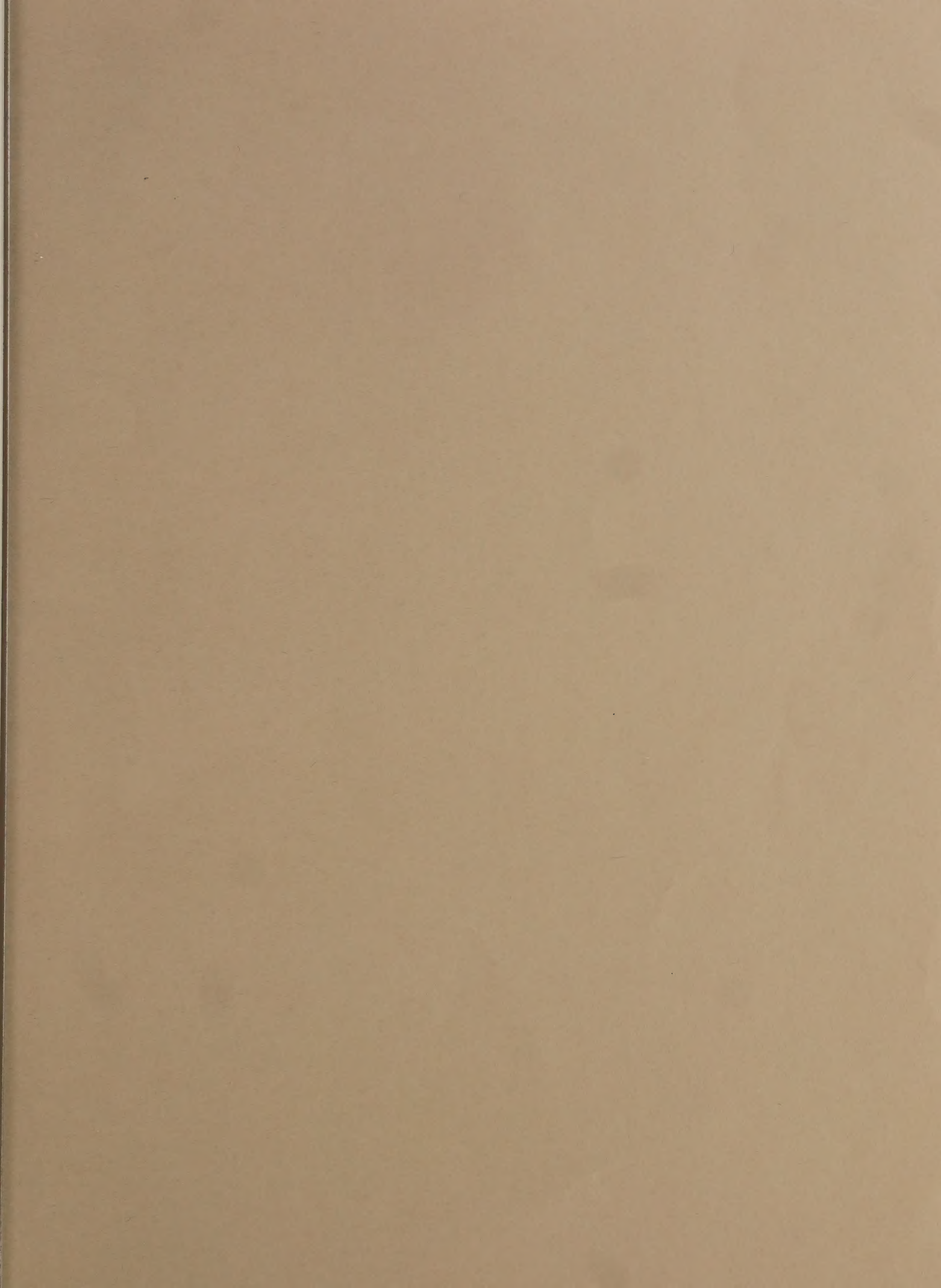
b/ Data in this column for "other" and "total" were not reported because two or more materials may have been used on the same acre, resulting in multiple counting.

Table E-5. Defoliant and desiccant use on cotton in the Far West: Acres treated, acre-treatments, rates and quantities used, single ingredient and tank-mix applications, 1979 a/

	: Acres	:	:Pounds of active ingredient:		No. of	
	:treated	: Acre-	:	: Per	: applica-	:
Defoliant/Desiccant	: b/	:treatments:	Total	:Season	:Treatment	: tions
	-----Thousand-----					
<u>Single materials</u>						
Arsenic acid	68.2	82.1	280.9	4.1	3.4	1.2
Cacodylic acid	103.9	160.3	333.7	3.2	2.1	1.5
DEF	759.6	855.2	1,867.2	2.5	2.2	1.1
Endothall	111.7	132.5	29.7	.3	.2	1.2
Magnesium chlorate	80.7	101.5	87.7	1.1	.9	1.3
Paraquat	328.3	347.0	249.0	.8	.7	1.1
Sodium chlorate	1,020.9	1,203.0	6,549.4	6.4	5.4	1.2
Total	-	2,881.6	9,397.6	-	3.3	-
<u>Tank mixtures</u>						
Cacodylic acid	52.4	52.4	36.4	.7	.7	1.0
+ DEF			53.0	1.0	1.0	
Cacodylic acid	30.0	30.0	27.0	.9	.9	1.0
+ paraquat			15.2	.5	.5	
DEF	127.4	127.4	205.4	1.6	1.6	1.0
+ endothall			34.2	.3	.3	
DEF	76.8	76.8	209.7	2.7	2.7	1.0
+ paraquat			17.0	.2	.2	
DEF	22.5	50.0	26.7	1.2	.5	2.2
+ paraquat			5.9	.3	.1	
+ sodium chlorate			73.6	3.3	1.5	
DEF	22.5	22.5	86.2	3.8	3.8	1.0
+ sodium chlorate			49.4	2.2	2.2	
Endothall	62.7	62.7	11.3	.2	.2	1.0
+ sodium chlorate			316.6	5.0	5.0	
Paraquat	157.1	157.1	49.5	.3	.3	1.0
+ sodium chlorate			461.7	2.9	2.9	
Other	-	39.5	28.8	-	.7	-
Total	-	618.4	1,606.7	-	2.6	-
TOTAL DEFOLIANTS/ DESICCANTS	-	3,500.0	11,004.3	-	3.1	-

a/ "1979 Cotton Pesticide Use Survey," USDA, ESCS, Natural Resource Economics Division. Includes Arizona, California, and New Mexico.

b/ Data in this column for "other" and "total" were not reported because two or more materials may have been used on the same acre, resulting in multiple counting.









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